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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/061,830	01/31/2002	Qin Liu	10014405-1	2306

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EXAMINER	
YUAN, DAH WEI D	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/061,830	LIU ET AL.	
	Examiner	Art Unit	
	Dah-Wei D Yuan	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,11-17,20 and 82-97* is/are pending in the application.

4a) Of the above claim(s) *90-97* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11-17,20 and 82-89* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FUEL CELL WITH FUEL DROPLET FUEL SUPPLY

Examiner: Yuan S.N. 10/061,830 Art Unit: 1745 September 30, 2004

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on April 7, 2004.

Specification

3. The amendment filed on June 28, 2004 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: a fuel supply path extending in a direction that is non-perpendicular to the anode plane in claim 82; the fuel supply path is substantially parallel to the anode plane in claim 83.

Applicant is required to cancel the new matter in the reply to this Office Action.

Election/Restrictions

4. Newly submitted claims 90-97 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The subject matter of aforementioned claims is "a fuel cell system comprising a fuel cell including two substantially parallel surfaces and a fuel supply apparatus that directs a plurality of fuel droplets straight into the fuel passage between the two substantially parallel surfaces", which is a distinct species from the "a fuel cell system comprising a fuel cell stack including a plurality of anodes and a single fuel supply apparatus that supplies a plurality of fuel droplets to each of the anodes" as recited in the original claims.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 90-97 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

5. Claims 82-89 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The limitations "a fuel supply path extending in a direction that is non-perpendicular to the anode plane" in claim 82 and "the fuel supply path is substantially parallel to the anode plane" in claim 83 are not supported in the specification. If applicant believes said limitations

are fully defined, it is requested that applicant indicates column and line, and/or figure with number, in the instant disclosure.

Claim Rejections - 35 USC § 102

6. The claim rejections under 35 U.S.C.102(e) as being anticipated by Kindler et al. (US 6,440,594 B1) on claims 1-3,7,8,11-15,17,20 are maintained. The rejection is repeated below for convenience.

With respect to claims 1,3,8,11,14, Kindler et al. teach a direct oxidation fuel cell system comprising a plurality of anodes, a plurality of cathodes, a plurality of electrolyte and a fuel reservoir. The fuel is provided in the form of an aerosol of liquid fuel droplets suspended in a gas. The aerosol is formed in a single aerosol generator situated within the anode chamber of the fuel cell. Figure 6 is a schematic representation of a preferred fuel cell system incorporating a stack of individual membrane electrode assemblies and a flow field element having an integral aerosol generator (a single fuel supply apparatus). Alternatively, the pump (20) can be considered as the single fuel supply apparatus. Furthermore, the anode pair is interpreted as the series of anodes above the anode bipolar plate (602) as shown in Figure 6, wherein fuel is distributed between at least one anode pair. See Abstract; Column 1, Line 64 to Column 2, Line 11; Column 3, Lines 29-34; Column 5, Lines 27-47; Figure 6.

With respect to claim 2,13,17,20 the amount of aerosol fuel delivered to the anode depends upon the particular oxidation catalyst used in the anode, the permeability of the membrane in the electrode assembly to liquid fuel, the fuel concentration in the aerosol droplets,

and the temperature and pressure within the cell. By monitoring fuel cell operating characteristics it is possible to determine an optimum aerosol feed rate for a give fuel cell configuration and cell operating conditions. For example, monitoring fuel cell power output, cell potential, or operating current provides convenient measures of fuel cell operating performance suitable for use in controlling the rate of aerosol fuel delivery to the anode. Preferably, the fuel droplet delivery rate is controlled by varying the duty cycle of the aerosol generator to maintain a desired cell output potential at a given power output. See Column 7, Lines 31-67. Kindler et al. do not specifically disclose the presence of a controller in the fuel cell system. However, it is the position of the examiner that such controller is inherent, given that both Kindler et al. and the present application utilize similar operation procedure and control sequence to operate the direct oxidation fuel cell system. Also, a controller would be essential to monitor and regulate the fuel droplet delivery rate into the fuel passage. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature *is necessarily present in that which is described in the reference.* In re Robertson, 49 USPQ2d 1949 (1999).

With respect to claim 7,12,15, Kindler et al. further teach any number of means for forming an aerosol may be employed. For example, an aerosol may be formed by heat the fuel to a temperature above its boiling point in the presence of the suspending gas, then rapidly cooling the superheated fuel vapor to nucleate condensed droplets of liquid fuel suspended in the gas. The aerosol is preferably formed by atomizing the liquid fuel into the suspending gas. A wide variety of atomization means are known to those skilled in the art and may be employed in this invention. These include orifices, single fluid atomization nozzles (airless sprayers), two

fluid atomization nozzles (gas-assisted sprayers), rotating discs or wheels onto which the liquid is fed, or ultrasonic nozzles in which liquid is feed onto a needle or orifice oscillated at very high frequency to form liquid droplets in a suspending gas. See Column 7, Lines 14-30.

Claim Rejections - 35 USC § 103

7. The claim rejections under 35 U.S.C.103(a) as being unpatentable over Kindler et al. on claims 4-6 are maintained. The rejection is repeated below for convenience.

Kindler et al. disclose a fuel cell system comprising an ultrasonic atomizer as the fuel supply apparatus as described above in Paragraph 6. However, Kindler et al. do not specifically disclose the use a thermal drop ejector, a piezoelectric drop ejector, or a flextensional drop ejector to produce the fuel droplets into the fuel passage. However, ultrasonic atomizer, thermal drop ejector, piezoelectric drop ejector, and flextensional drop ejector are considered functionally equivalent fuel supply apparatus. See instant specification page 4, lines 8-17; page 10, line 25 to page 11, line 9. Therefore, it would have been obvious to one of ordinary skill in the art to substitute a thermal drop ejector (or a piezoelectric drop ejector, or a flextensional drop ejector) for the ultrasonic atomizer as the fuel droplet generating means in the fuel cell system disclosed by Kindler.

8. The claim rejections under 35 U.S.C.103(a) as being unpatentable over Kindler et al. as applied to claims 1-3,7,8,10-20 above, and further in view of Singh et al. on claim 9 are maintained. The rejection is repeated below for convenience.

Kindler et al. disclose a fuel cell system as described above in Paragraph 6. However, Kindler et al. do not disclose that the fuel cell system further comprising storage means for storing energy generated by the system. Singh et al. teach an electrical storage device is coupled in parallel to a fuel cell power generation system. The electrical storage device is either a battery pack, a plurality of capacitors, or a plurality of supercapacitors. The electrical storage device is capable of minimizing the unreacted fuel within the anode chamber. See Abstract, Column 1, Lines 40-64; Column 2, Lines 3-29. Therefore, it would have been obvious to one of ordinary skill in the art to coupled an electrical storage device to the fuel cell system of Kindler et al. in parallel, because Singh et al. teach the use of either a battery pack, capacitors or supercapacitors to reduce the amount of excess fuel during transient operating conditions.

10. The claim rejections under 35 U.S.C.103(a) as being unpatentable over Kindler et al. as applied to claims 1-3,7,8,10-20 above, and further in view of Pun on claim 16 are maintained. The rejection is repeated below for convenience.

Kindler et al. disclose a method of operating a fuel cell as described above in Paragraph 6. However, Kindler et al. do not disclose the use of a fan in blowing the droplets towards the anode. Pun teaches that fans and blowers are required to project the atomized droplets to intended targets. See Column 1, Lines 22-25. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate a fan on the method of operating a fuel cell of Kindler et al., because Pun teaches the use of a fan to help project the atomized droplets to the intended targets (anode plates) in the fuel cell system.

Response to Arguments

11. Applicant's arguments filed on February 17, 2004 have been fully considered but they are not persuasive.

Applicant's principle arguments are

(a) Figures 4,7,8,9,13,18,19 show the beginning, middle and end of the travel path of the fuel droplets;

(b) the specification and drawings clearly indicate that the droplets are fired straight into the fuel passage and continue along a path that is substantially parallel to the anode surface;

(c) the specification is equally clear about those instances where the fuel droplet path does not extend in a direction that is substantially parallel to the anode surface. See page 10, lines 9-1, Figures 17,18;

(d) Kindler patent fails to teach or suggest each and every element of the combination recited in independent claim1.

In response to Applicant's arguments, please consider the following comments.

(a) According to the brief descriptions of the drawings, those figures display the diagrammatic views of the fuel cell system. There is no teaching or discussion of the movement or direction of the fuel droplets in the original specification. Also, it is unclear what those black dots in the fuel passage stand for. Even assuming they are representatives of the fuel droplets, does one dot represent one fuel droplet or a cluster of fuel droplets? Further, the width of the dotted area

varies along the travel direction of the fuel (See Figures 4,7,8,9,13,19). How can it be possible to interpret that the travel direction of the droplets is parallel to the surface of the anode surface. As stated in the Advisory Action, these figures are merely schematic and only show the delivery of fuel droplets into a pair of anode, but provide no information concerning the sequential movment of the droplets. When the referene does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on the measurement of the drawing features are of little value. See Hockerson-Halberstadt, Inc. V. Avia Group Int'l, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000);

(b) an amendment to the claim which has no antecedent basis in the specification and/or drawings as originally filed introduces new matter because that subject matter is not described in the application as originally filed. See MPEP 2163;

(c) the Applicant is correct in pointing out that such statement is proper because it has the support in the instant disclosure. However, newly added claim limitations are not supported in the specification through express, implicit, or inherent disclosure;

(d) Figure 6 of Kindler illustrates an aerosol generator (a single fuel supply apparatus) comprising a plurality of individual in situ atomizer, each atomizer (612) situated at the inter surface of the anode biplate (602) so as to atomize liquid fuel droplets into each anode chamber (616). See Column 15, Line 66 to Column 16 Line 10.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (571) 272-1295. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dah-Wei D. Yuan
September 30, 2004